Assignment

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Subject: QTM
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Exercise 3.1:

Q1:

Median: represents the middle value of a data distribution.

Mode: represents the most frequent value of a distribution.

Mean: takes all the specific values into account.

Q#2:

The symbol used for sample statistics is $\bar{x}$.

The symbol used for population parameter is μ.

Q#6: Data set given: (Book)

2, 2, (3), 6, 10

(a) Compute:

$$\text{Mean} = \frac{\text{Sum of all data enteries}}{\text{Number of all data enteries}}$$

$$= \frac{2+2+3+6+10}{5}$$

$$= 23/5$$

$$\text{Mean} = 4.6$$

Mode = 2 (occurs frequently)

Median = 3 (middle value)

(b) Add 5 to each data entery:

Data becomes:

7, 7, 8, 11, 15

Compute:

Mode = 7

Median = 8

$$\text{Mean} = \frac{7+7+8+11+15}{5}$$

$$= 48/5$$

Mean = 9.6

(c) Adding the same number i.e 5 to each data value results in mode, median and mean increases by 5 units.

Q#7 (Book)

Data given:

2, 2, 3, 6, 10

(a) Compute:

Mode = 2

Median = 3

$$\text{Mean} = \frac{2+2+3+6+10}{5}$$

$$= 23/5$$

Mean = 4.6

(b) Multiply by 5.

The data becomes: 10, 10, 15, 30, 50

Mode = 10

Median = 15

$$\text{Mean} = \frac{10+10+15+30+50}{5}$$

$$= 115/5$$

Mean = 23

(c) Corresponding values are 5 times the original averages. Multiplying each data value by 5 results in mode, median and mean changing by a factor of 5.

(d) Given data of average heights of airplane passengers.

Mode = 70 inches

Median = 68 inches

Mean = 71 inches

Compute in centimeters (cm):

Mode = 70 in x 2.54

= 177.8 cm

Median = 68 in x 2.54

= 172.72 cm

Mean = 71 in x 2.54

= 180.34 cm

Q#9: Given data of the ground temperatures:

146 152 168 174 180 178 179

180 178 178 168 165 152 144

Arranging the data given:

144 146 152 152 165 168 168
174 178 178 178 179 180 180

$$\text{Mean} = \frac{\text{Sum of all the given data}}{\text{Number of all given data}}$$

$$= \frac{144+146+152+152+165+\cdots+180+180}{14}$$

$$= \frac{2342}{14}$$

$$= 167.28$$

Mean $\simeq 167.3\,^{\circ}F$

$$\text{Median} = \frac{\text{Sum of 2 middle values}}{2} \quad \text{(Even data)}$$

$$= \frac{168+174}{2}$$

Median $= 171\,^{\circ}F$

Mode $= 178\,^{\circ}F$ (Most repeated value).

Ex# 3.2 :

Q#6 (Book)

Data Given:

5, 9, 10, 11, 15

(a) Compute s:

$$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

$\bar{x} = \frac{\Sigma x}{n}$ (Sum of given data / No of given data)

$$\bar{x} = \frac{5+9+10+11+15}{5}$$

$\bar{x} = 50/5$

$\bar{x} = 10$

x	$x-\bar{x}$	$(x-\bar{x})^2$
5	$5-10=-5$	$(-5)^2=25$
9	$9-10=-1$	1
10	$10-10=0$	0
11	$11-10=1$	1
15	$15-10=5$	25
$\Sigma x=50$		$\Sigma(x-\bar{x})^2=52$

$$s = \sqrt{\frac{52}{5-1}}$$

$$s = \sqrt{52/4}$$

$S = \sqrt{13}$

$\boxed{S = 3.6}$

(b) Adding 5 to data set.

New data set given:

10, 14, 15, 16, 20

Compute s?

$$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

$$\bar{x} = \frac{\Sigma x}{n}$$

$$= \frac{10+14+15+16+20}{5}$$

$$= 75/5$$

$$\bar{x} = 15$$

x	$x-\bar{x}$	$(x-\bar{x})^2$
10	$10-15=-5$	$(-5)^2=25$
14	$14-15=-1$	1
15	$15-15=0$	0
16	$16-15=1$	1
20	$20-15=5$	25
$\Sigma x=75$		$\Sigma(x-\bar{x})^2=52$

$$s = \sqrt{\frac{52}{5-1}}$$

$$s = \sqrt{52/4}$$

$s \approx 3.6$

(c) Adding any number to each data value does not change the standard deviation i.e spread between data values does not change.

Q#7:

Given data:

5, 9, 10, 11, 15

(a) Compute s:

$$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

$$\bar{x} = \frac{\Sigma x}{n}$$

$\bar{x} = 10$

(Table done in previous question) Q#6

$$s = \sqrt{\frac{52}{5-1}}$$

$$s = \sqrt{52/4}$$

$$s = \sqrt{13}$$

$$s = 3.6$$

(b) Multiply 5 to data set:

New data set: 25, 45, 50, 55, 75.

$$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

$$\bar{x} = \frac{\Sigma x}{n}$$

$$= \frac{25+45+50+55+75}{5}$$

$$\bar{x} = 250/5$$

$$\bar{x} = 50$$

x	$x-\bar{x}$	$(x-\bar{x})^2$
25	$25-50=-25$	625
45	$45-50=-5$	25
50	$50-50=0$	0
55	$55-50=+5$	25
75	$75-50=25$	625
$\Sigma x=250$		$\Sigma(x-\bar{x})^2=1300$

$$s = \sqrt{\frac{1300}{5-1}}$$

$$s = \sqrt{\frac{1300}{4}}$$

$$s = \sqrt{325}$$

$$s \approx 18.0$$

(c) When each data is multiplied by 5, the standard deviation is five times greater than that of original data set.

(d) No. Multiply given data $s = 3.1$ miles with 1.6 to convert it into kilometers as 1 mile = 1.6 km.

$$s = 3.1 \times 1.6 \text{ km}$$
$$s \approx 4.96 \text{ km}$$

Q#8: (Book)

(a) No

(b) Yes, since 80 is more than 2.5 standard deviation above the mean.

Q#9: (Book)

Given sample data:

x:	23	17	15	30	25

(a) Range?

Range = largest value − smallest value

$= 30 - 15$

Range = 15

(b) Verify $\Sigma x = 110$ and $\Sigma x^2 = 2568$

(d) Compute σ^2 and σ:

x	$x-\mu$	$(x-\mu)^2$
23	$23-22=1$	1
17	$17-22=-5$	25
15	$15-22=-7$	49
30	$30-22=8$	64
25	$25-22=3$	9
$\Sigma x=110$		$\Sigma(x-\mu)^2=148$

$$\therefore \mu = \frac{\Sigma x}{N}$$

N = No of data set.

$$= \frac{110}{5}$$

$$\mu = 22$$

$$\text{population variance} = \sigma^2 = \frac{\Sigma (x-\mu)^2}{N}$$

$$= \frac{148}{5}$$

$$\sigma^2 = 29.6$$

$$\sigma = \sqrt{\sigma^2}$$

$$\sigma = \sqrt{29.6}$$

$$\sigma \simeq 5.44$$